

Wind Cave National Park and Custer State Park Red Valley Prescribed Fire Monitoring Report

*Prepared by Katie Johnson
Wind Cave National Park*



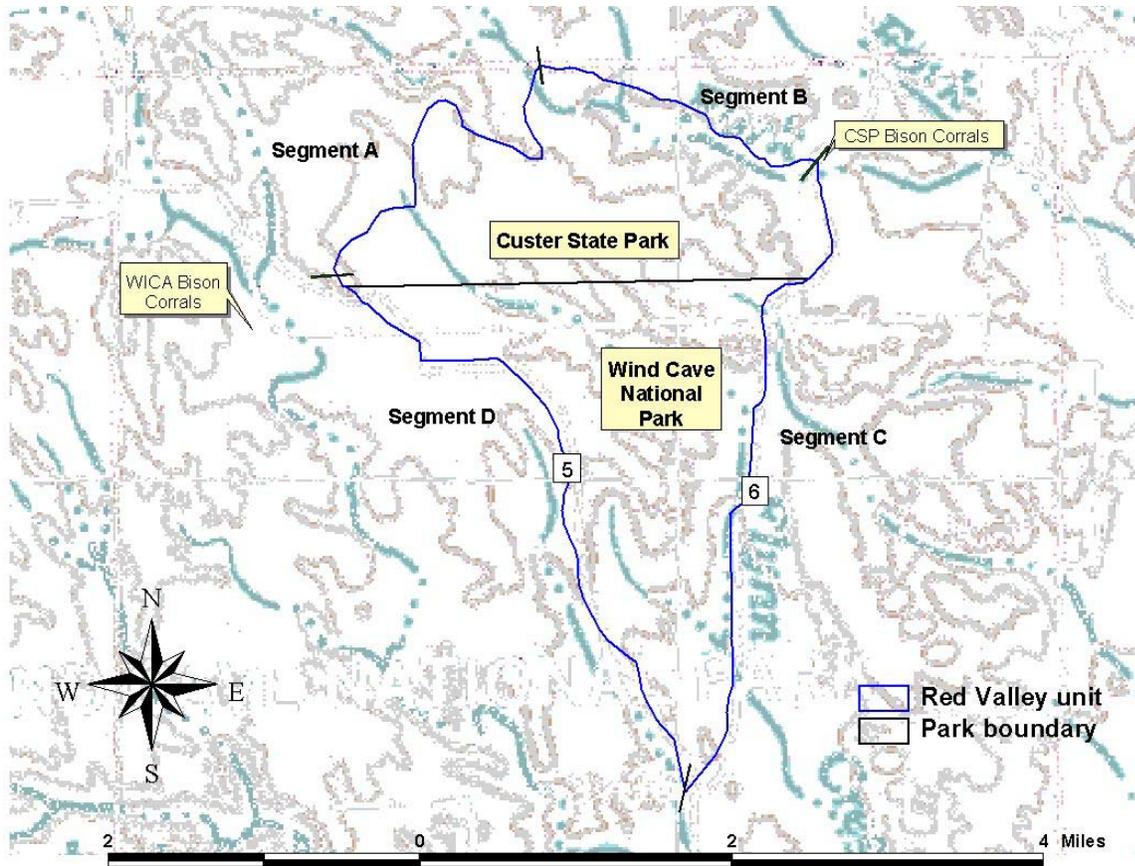
Burn Unit Summary

The Red Valley RX unit is a 4200 acre unit that burned over one operational period on 15 April 2004. This unit was divided into 4 segments which were ignited separately, both on the ground and aerially. This project was completed in a safe manner and was successful due to the combined effort of over 160 personnel from more than 7 different entities.

Vegetation Type: 80 % Native Mixed Grass Prairie, dominated by western wheatgrass
20 % Ponderosa Pine, Juniper, and various hardwoods

Personnel: Burn Bosses: Dan Morford (WICA), Al Stover (CSP)
Ignition Specialists: Eric Allen (WICA), Brian Daunt (NBF)
Holding Specialist: Doug Alexander (WICA)
Fire Monitors: Andy Thorstenson (lead), Cody Wienk, Martha Jakobek, Katie Johnson
Task Force Leader and Ignition (respectfully):
Segment A: Esser (CSP), Hill (CSP)
Segment B: Scott (CSP), Walker (CSP)
Segment C: Kevin Merrill (WICA), Bob Kobza (WICA)
Segment D: Steve Ipswitch (WICA), Jim Dahlberg (WICA)
17 Type 6 Engines
3 ATV's with water, 1 ATV with drip torch
4 Water Tenders
1 Type 3 helicopter

Operations on 16 April required perimeter patrol and minimal mopup of some heavy fuels. Four type 6 engines and a 20-person handcrew conducted operations from 0800 to 1500. Fire effects monitors conducted post-burn severity measurements on monitoring plots.



Objectives

Objectives of the Red Valley RX are as follows:

Grasslands:

- Reduce Kentucky Bluegrass to < 20% of the grass cover in areas of cool season grasses
- Increase native grasses to > 75% of grass cover in areas of cool season grass and >95% of grass cover in areas of warm season grass

Forest:

- Areas dominated by Ponderosa Pine will be ignited by either aerial or hand ignition
- Achieve > 30% mortality (within 2 yrs. post-burn) in Ponderosa Pine with >15 cm dbh
- Achieve > 50% mortality (within 2 yrs. post-burn) in pole size Ponderosa Pine (2.5 – 15cm dbh)
- Achieve > 70% mortality (within 2 yrs. post-burn) in Ponderosa Pine seedlings

Hardwoods and shrubs:

- Areas dominated by hardwoods and shrubs will not be ignited by other means if they fail to ignite after aerial ignition. These areas will be allowed to burn in a mosaic pattern.

Weather Observations

Weather taken from sections A and B

Time	Temperature		Dew Point	RH	Wind		Comments
	Dry	Wet			Speed	Direction	
1030	63	46	28	27	6-8 G 10	WNW	20% cirrus
1130	67	48	29	24	7-9 G 13	WNW	20% cirrus
1300	70	49	28	21	8-10	W	10% cirrus
1330	68	48	28	22	7 G 10	WSW	30% cirrus
1440	72	49	25	17	13-17 G 22	W	40% cirrus
1545	70	47	20	15	15-20 G 23	W	50% cirrus
1700	70	46	15	12	6-11 G 15	SW	
1710	70	47	20	15	5	WSW	40% cirrus
1730	68	46	20	16	13-15 G 20	W	Clouds building to the west

Weather taken from sections C and D

Time	Temperature		RH	Wind		Comments
	Dry	Wet		Speed	Direction	
1000	64	45	21	6 G 11	W	Test burn
1140	67	46	18	19 G 27	W/WSW	15% cirrus
1250	70	48	18	6-8 G 16	NW	20% cirrus
1345	70	48	18	8-10 G 13	WNW	10% cirrus
1435	71	48	16	9-11 G 20	W	15% cirrus
1545	71	47	13	8-10 G 28	W	20% cirrus
1630	70	47	15	10 G 27	W/SW	50% clouds, building to the west
1730	70	46	12	16 G 26	W/WSW	50% clouds, small ridge top, gusty
1830	66	44	13	20-22 G 35	W	100% clouds

A RAWS (Remote Access Weather Station) was set up near the perimeter of the prescribed fire.

Fire Behavior Observations

Fire Behavior in Segments A & B

Time	Location	Fire Type	ROS	FL	Comments
1040	Test burn, briefing site	b			Active backing in little bluestem
1120	Lame Johnny, seg. B	h/f		6-8"	Active in chokecherry litter
1130	"	h		30-50'	Group torching in small trees
1145	Segment B	b/f	2.2	1-2"	
1155	"	b/f	1.3	12-18"	100% active perimeter
1300	Seg. B, forested ridge	b	1	12-24"	North aspect
1320	"			30'+	Group torching, fire whirls, spots
1410	"	f		3-4'	
1740	Seg. B	b	.8	12-18"	1's and 10's 90% consumed
1750	"	h	7.3	3-4'	Reduced consumption
1800	"	h	40	3-4'	Some climbing up trunks
1805	"	h	180	3-4'	

Fire Behavior at Segments C & D

Time	Location	Fire Type	ROS	FL	Comments
1215	Near elk enclosure, WC 6 Rd.	b	2.4	8-10"	Flame depth 4-6"
1235	Just past elk enclosure	h	105	2-3'	
1235	"	h	103	3-4'	Flame depth 10-12"
1240	"	b	.52	10-12"	Flame depth 4-6"
1250	"				Fire and ash whirls
1420	S of Cottonwood enclosure	b	1.62	10-12"	Flame depth 4-6"
1900	Near DP 1, WC 5 Rd.	h/f	7.5	1-2'	Flame depth 10-12"

ROS = rate of spread measured in chains per hour (1 chain = 66 feet or 20 meters)

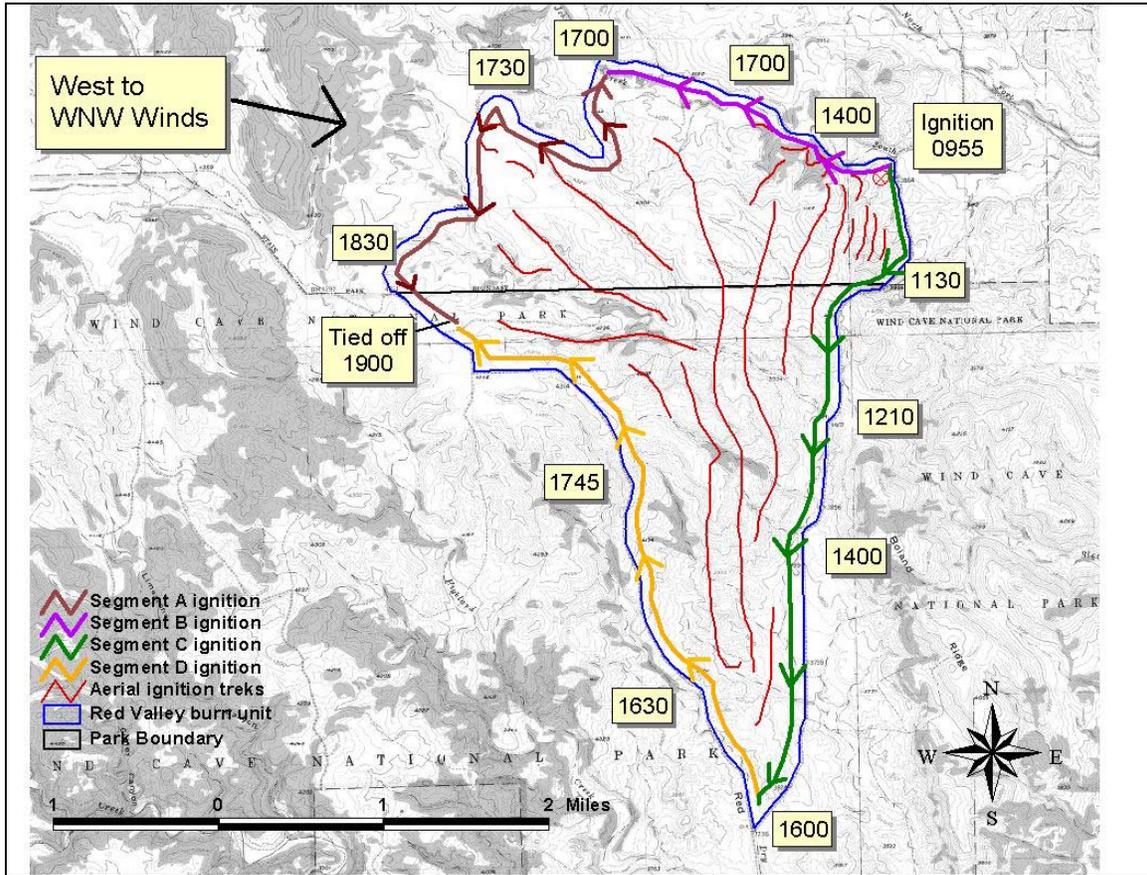
b = backing fire; f = flanking fire; h = head fire

Grassland Biomass and Soil Moisture

Type	Sample size	Fuel Loading	Average Fuel Loading	Soil Moisture	Average Soil Moisture
Western Wheat	3	1.93 tons per acre	2.28 tons per acre	12.3%	16.57%
Western Wheat	3	1.66 tons per acre		18.5%	
Western Wheat	3	3.26 tons per acre		19.6%	
Kentucky Bluegrass	3	1.29 tons per acre		15.9%	

Fuel loading was measured on 2 Browns transects in Ponderosa pine stands in Segment B in Custer State Park. Preburn fuel loading measured 35.4 tons/acre in storm blown stand and 12.14 tons/acre in Ponderosa pine.

Fire Progression



At 0955 hours a test burn began at the northeast corner of the Red Valley burn unit in Custer State Park. From there, two ignition teams proceeded south along segment C bringing backing fire as shown in green in the above map. One ignition team dropped off at the park boundary and the other team continued bringing backing fire south to the very southern most point of the unit until 1600. One ignition team proceeded west from the initial ignition point at 1115 along segment B (purple line), moving slowly due to heavy fuel and steep slopes. On 2 occasions, spot fires crossed the CSP Wildlife Loop road. The furthest spot was at ridge top about one quarter mile from the perimeter due to gusting winds up to 25 mph from the west south west. This spotting was caused by group torching on north slopes near the perimeter. Segment B was complete at 1730, where it was met by the Segment A ignition team as shown in brown. Segment A began at 1700 and brought head fire to the northwest corner of the unit then continued south toward Segment D. Ignition along segment D initiated at 1600 and continued until 1900 when the team was met by the segment A team, thus completing the Red Valley ignition.

At 1240 aerial ignition was initiated starting in the northeast corner of the burn unit and moving westward. North to south trending strips of fire were established as shown in red in the map above. Aerial ignition was used on forested ridge tops of Segment B. After 1600 hours, northwest to southeast strips were ignited in the northwest corner as well as north-south interior strips until ignition ceased at 1905.

Smoke Monitoring

Due to predominantly west northwest winds during the operational period, holding resources along the eastern perimeter of the burn unit were impacted by smoke. Fireline visibility was fair on the eastern perimeter with visibility often ranging from less than 100 feet to a half a mile for personnel on the Wind Cave NPS 6 road used as the fireline. Throughout the day, the smoke column rose from 200 to 1500 feet above the fireline and followed the topography to the east as it dissipated. The National Weather Service called for excellent smoke dispersal and a mixing height of 10,000 feet. The gusty winds, often times up to 30 mph, aided with the smoke dispersal but kept smoke from rising significantly. After 1430, winds consistently gusted up to 20 mph and often surpassed 25.

Fire Monitoring

Four long-term monitoring plots and four seedling monitoring plots are located within the Red Valley burn unit in Wind Cave National Park. Three monitoring plots are dominated by western wheatgrass and one plot is Kentucky bluegrass dominated. As observed in the immediate post-burn severity assessment, approximately 93% of the total plot area burned. On these 4 plots, it was observed that 3% was "heavily burned," 35% was "lightly burned," 32% was "moderately burned," 22% was "scorched," and the remaining 7% was unburned. This translates to most grass plant bases burned to less than 2 inches tall. The litter layer was charred to partially consumed with no distinctive alteration of soil. These plots will be read after 1, 2, 5, and 10 growing seasons after prescribed fire treatment to determine vegetation changes.

Custer State Park has installed 2 fuel loading transects (Brown's lines) and 3 range transects which will be re-sampled in the summer of 2004.

Conclusions

The effects of the Red Valley prescribed fire on vegetation and wildlife in Wind Cave National Park and Custer State Park will be assessed through a variety of sampling techniques. Objectives need to be viewed over the course of several years before results can be determined. With a long term ecological monitoring program in place, a quantifiable assessment of prescribed fires' specific objectives can be made.

